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Presidential Lectures

I-9 Construction and development of new infectious disease hospitals

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Infectious disease hospitals are the front line of the treatment of infectious diseases and the basic net of the infectious diseases' treatment system. With the incidence change of infectious dieases and introduction of modern hospital management pattern, new patterns and thoughts are needed in the construction and development of infectious disease hospitals, that is 'modernization, digitalization, humanitilization, gardern-like and green'.
Modernization refers to more advanced equipments, service establishements and service procedure. Advanced equipments should cover the field of treatment, examination, test, which can improve the accuracy of diagnosis and treatment greatly. Advanced service establishements could help avoiding the cross infection to certain extent and improve the efficiency. Advanced service procedure is deemed to ensure the patients' safety as they seek medical service in the infectious disease hospitals to the most extent and the design must obey the principle of 'tri-aera tri-line'. Digitalization includes three parts as the digitalization of basic medical information, assistant medical information and service system, which can help improving the service efficiency greatly and making the decision more wisely. Humanitilization means to respect people's basic need, to provide them with more comfortable medical environment and the patients-oriented service pattern. Gardern-like refers to more beautiful scene inside hospitals. Green means none infection or none polution in the infectious disease hospitals.

I-10 Overview of MRSA

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Methicillin-resistant strains of *Staphylococcus aureus* emerged soon after the introduction of methicillin into clinical practice. This was followed from the mid-1970s by outbreaks of MRSA infection in many countries, mostly caused by a single epidemic strain being transferred between hospitals. The picture of MRSA within the hospital setting is now one of both epidemic and sporadic infection caused by a broader range of strains.
The salient feature of the *S. aureus* genome is the presence of a large number of mobile elements that often carry pathogenic or drug resistance determinants, or both. MRSA contain one resistance island called SCC*mec*, i.e. an exogenous piece of DNA that may vary between 15 to 60 kb and is absent from methicillin-susceptible staphylococci.
Five types of SCC*mec* were discriminated on the basis of their structures. These five types are likely to mirror major original MRSA clones. Notably, types I, II, and III were shown to belong to hospital clones, and harbor multiple resistance determinants. A limited number of MRSA lineages has emerged from the transfer of SCC*mec* into successful methicillin-susceptible *S. aureus* (MSSA) clones.
Methicillin resistance in MRSA strains is due to the horizontal acquisition – from an unidentified species – of the *mec*A gene, which encodes PBP2a, a novel PBP that is highly resistant to inhibition by β-lactams and maintains cell wall synthesis at normally lethal β-lactam concentrations. MRSA strains are often heteroresistant to beta-lactam antibiotics in that two subpopulations (one susceptible and the other resistant) coexist within a culture.
β-lactam agents other than methicillin may appear active *in vitro*, but are not effective clinically. Results for these drugs should be reported as "resistant" or should not be reported. This is because most cases of documented MRSA infections have responded poorly to β-lactam therapy, or because convincing clinical data have yet to be presented that document clinical efficacy for those agents.
The *mecA* gene is bracketed by one or two copies of IS431, which are believed to serve as a gene collector and may promote the local insertion of additional determinants, such as antibiotic resistance genes. Thus, co-resistance to several antibiotic classes is a typical feature of MRSA, although it varies according to the different geographic regions.
MRSA rates are increasing worldwide and in different clinical settings. MRSA were classically associated with hospitals or long-term care facilities, and with invasive procedures such as dialysis, indwelling catheters and prosthesis. The rare MRSA in the community used to originate from health care institutions.
"Classical" community-acquired MRSA (CA-MRSA) have been spreading among healthy people in the community, mostly via skin-to-skin contacts (close contact sports such as wrestling and rugby, and prison inmates). Most CA-MRSA appeared to contain the Panton–Valentine Leukocidin (PVL) gene, encoding for an extracellular product of *S. aureus* responsible for skin infections and severe necrotising pneumonia (also fatal cases).
However, the actual picture is far more complex, univocal microbiological definition is puzzling (carriers and European patients often harbour PVL-negative CA-MRSA) CA-MRSA are invading hospital settings, differences between CA-MRSA and HA-MRSA get smaller and antibiotic resistance (on novel plasmids) is on the surge.